Wound Bed Preparation

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The management of even extensive acute wounds is generally a straightforward process but the smallest of chronic wounds frequently presents practitioners with a considerable challenge. Practitioners have for many years struggled with an ever increasing range of more and more sophisticated wound management products with, it may seem in clinical reality not huge improvements on healing rates or symptom control. In some instances this may be seen to relate to the desire to 'just get on with' the wound care which does not rely on good assessment and where assessment is superficial it is likely that underlying factors will not be identified and therefore the management plan will fail to address the perpetuating factors thus resulting in less than optimal results. This does not negate however the real sense of disillusionment faced by practitioners when dealing with patients who may have had the same unremitting chronic wound for 5, 10 or even 20 years. It is understandable why many practitioners feel frustrated and unsupported when they feel that they are doing their best in frequently difficult and poorly resourced situations and making little or no progress.

In an attempt to move this situation forward many practitioners have started to discuss the wound bed preparation model. Whilst it is widely acknowledge that there is little new or innovative in the model, it is the simplicity, structure and logical progression of the model, which has encouraged many practitioners to embrace its central tenants. Much has been written about wound bed preparation, and a variety of definitions as to what this means exists. Broadly speaking it has been described as; 'the desire to provide an optimal environment by producing a stable wound bed with minimal exudate' (Dowsett 2002) and 'the acceleration of endogenous healing to facilitate the effectiveness of therapeutic products' (Falanga 2002a).

Wound bed preparation is a changing paradigm that links treatment to the cause by focusing on three components of local wound care, i.e. debridement, bacterial balance and moisture balance (Sibbald et al 2000). These changes are underpinned by ever increasing knowledge of the biological micro environment within a chronic wound and centre on the inter- relationship of functionally abnormal cells, bacterial balance, inappropriate biochemical messages and dysfunctional wound matrix component (Vowden and Vowden 2002).

In order to progress the wound to orderly healing or a stage where the use of complex biotechnology products may be utilised the barriers to healing must be identified and removed (Schultz, Sibbald, Falanga et al 2003). This is not however a straightforward process, chronic wound healing is a complex process in which the cellular processes are inter-linked and often inter-dependant, and disruption or abnormal function may occur due to a multiplicity of intrinsic or extrinsic factors either individually or in a myriad of combinations. Therefore to view wound bed preparation, as simply achieving the three local components is overly simplistic, prior to determining local management options it is imperative to identify what are the potential factors causing or contributing to disruption and identify appropriate actions. The focus therefore of wound bed preparation is on proactive management of patients and their wounds rather that a reactive management style which responds to presenting symptoms.

Proactive management requires a greater depth of knowledge and understanding of the underlying physiological processes, the potential complications and also of advanced assessment techniques which may enable the practitioner to identify what is or may be about to go wrong. Proactive care considers control of symptoms before or as they occur rather than mopping up or managing them.

Traditionally in the management of chronic wounds much of the focus has been on the management of the symptoms, such as excessive exudate, pain or malodour, with little understanding of why these symptoms present and if indeed they may be controlled rather than managed. This is not universally the case for example in the management of leg ulceration, the focus of management with compression bandaging is about treating the underlying cause of the wound and dealing with the local symptoms are a secondary consideration which are addressed by the controlling of the underlying venous incompetence. Controlling the cause of the symptoms is also frequently the best management options for malodorous heavily exuding wounds where the underlying cause is infection; this is treated with appropriate anti microbial therapy and the local symptoms resolve. However in many other cases it is unclear to the practitioner what the underlying problem is, as the complex biological interactions are not understood or practical ways of identifying them are not available. This lack of understanding of the cause means that practioners may only be reactive to the presenting symptoms rather than adopt a more proactive approach to controlling the causal factors.

Whilst many techniques exist to help practitioners measure wounds and therefore assess wound progress or deterioration (Goldman and Salcido 2002) few of these techniques assist in determining which factors are impeding or assisting wound healing. A considerable amount of time is spent describing what is seen at the wound surface and attempting to extrapolate what these~~s~~ frequently inaccurate measurements mean. It is not suggested that measurement, photography and description of wounds are not useful in terms of measuring progress, simply that they encourage the emphasis on symptom management rather than control. Most wound assessment tools encourage the practitioner to measure the wound and approximate the percentage of the presenting tissue types i.e. slough, necrosis, granulation, epithelialisation. The focuses on changing these percentages does little to encourage the practitioner to consider what is happening in the wound or what may be done to manipulate this.

Anecdotally practitioners discuss a magical ‘dipstick’ a simple diagnostic tool that could be dipped into the wound and identify which chemical signals are missing, unbalanced or inappropriately expressed, this may appear at first to be a utopian ideal. However Pleat et al (2002) reviewed the currently available assessment techniques for identifying protein production, as wound healing is heavily dependant on the complex interplay of both functional and structural proteins. They suggest that proteomics (a suite of techniques that separates proteins according to physico – chemical properties) may provide rapid mass screening techniques using which it may be possible to compare the protein expression profiles in normal and poorly healing wounds allowing for the identification and potential targeting of therapeutically harmful mediators but also, as is the aim in wound bed preparation, identifying which external beneficial mediators may be the most appropriate for that individual’s wound at that particular point in the healing process. Whilst these tools that are able to identify the

complex cellular interplay of proteins are not yet widely available, other techniques that address reasons for delayed healing are, but are not always used to their full potential.

A wide range of assessment techniques are available to assess the vascular status of wounds, these vary in their complexity and availability (see table 1). Use of these techniques in addition to clinical observation and full history taking may help determine more appropriate goals in terms of managing chronic wounds where underlying blood supply contributes to the problem.

Table 1 (Goldman and Salcido 2002)
Ankle – brachial pressure index
Segmental volume plethysmography / Pulse volume recording
Transcutaneous oximetry

One further area where standard assessment techniques are frequently used but not fully explored would be in the identification of wound infection or more accurately in the review of the bacterial burden in wounds. Bowler (2002) reviewed the relevance of the widely accepted 10^5 cfu's as the definition of wound infection in chronic wounds and concluded that infection is about the ability of the host to manage the bioburden rather than the number of any individual bacterial species present. The previous emphasis on simply counting bacteria is being challenged as increasing knowledge arises about how bacteria function and the recent discussions related to the synergistic working of differing bacterial species in biofilms. (Davey and O'Toole (2000) suggests that small numbers of bacteria may be both increasingly harmful and more resistant to antimicrobial therapy when found in particular combinations and existing within these biofilms. Again research into biofilms is new and little information exists about which combinations of bacteria and in what proportions are the most harmful. However experienced clinicians are reconsidering their understanding of bacterial loading and more frequently using the presenting clinical signs and symptoms, which when combined with swab results may begin to identify patterns of bacterial virulence. A further complicating factor in determining the accuracy of microbial burden is the current discussion around bacterial screening techniques (Bill et al 2001, Dow et al 1999). Dow et al (1999) however suggest that semi quantitative bacteriology remains the most practical option, what the variety of screening techniques should encourage is greater collaboration with the microbiology team in order to determine the most appropriate mechanism for collection and sampling of bacteria for individual patients.

An area where control as opposed to management is particularly importance is in dealing with exudate. Chronic wound exudate differs from that of acute wounds in the profile of proteases and their inhibitors with chronic exudate being described as 'corrosive' in nature (Bishop et al 2003). One of the central principles of wound bed preparation is the maintenance of moisture balance, the principle of moist wound healing having been aimed for since the seminal work of Winter (1962). However there is little understanding of what is 'moist' as opposed to too moist or too dry. Bishop (2003) suggests that moisture balance at the wound – primary wound dressing interface can be regarded as a state where sufficient fluid is present to saturate the tissue's in-built fluid absorbency capacity and any excess is absorbed and retained by the dressing. In chronic wounds it is also important to consider the proteolytic activity

associated with the exudate, this plays a positive role in the facilitation of continuous autolytic debridement, however over expression may result in localised skin damage.

The underlying principles of moisture balance encourage the practitioner to consider in a more in depth way what the fluid is that is being produced and how it may best be managed. It would be unrealistic to suggest that clinicians should be able to identify how much of the fluid produced by a chronic wound is true exudate and how much is 'other fluids' e.g. transudate from oedema, liquifying slough or necrotic tissue produced as a result of debridement (Fletcher 2002). It is however reasonable to suggest that practitioners should identify that these factors may be the reason a wound has 'increased exudate levels' and plan management appropriate to that cause rather than immediately deciding the wound may be moving along the continuum towards infection and beginning antimicrobial therapy inappropriately. In both these instances it is possible to plan treatment that controls the level of fluid if the reason is clearly identified, if the underlying cause is not identified however practitioners simply resort to using more and more absorbent dressing products. Whilst this may eventually lead to the same outcome it may also increase the risk of complications such as maceration and excoriation, increasing the wound size and delaying further the healing process. Controlling the cause and therefore reducing the exudate produced is also considerably more beneficial to the patient in terms of reduction in malodour and leakage onto bedding or clothing which are both factors identified to have a high negative impact on patient's quality of life (Hamer et al 1994, Hyland and Thomson 1994).

Some may suggest that to follow the principles of wound bed preparation is beyond the remit of the average clinician, as it requires sophisticated diagnostic techniques and application of expensive biotechnology products. Equally it may appear that wound bed preparation is the panacea for all ills and that every wound can be healed. This is not the case, wound bed preparation is not a research technique or something that can only be used in specialist wound healing centres. The basic principles of thorough assessment and considering the implications of this, and proactive rather than reactive management, may be applied in any setting, it may mean more patients are referred on to specialist centres, but this is appropriate, it means that the 'average clinician' should feel more supported in the care they are providing and are able to deliver regularly the highest standards of wound care. It also means that it will be recognised where it may not be possible to heal a wound and that appropriate goals are set and resources are utilised more effectively.

In order to achieve the principles of wound bed preparation it must be acknowledged that there are considerable implications for both the provision of education for all clinicians and the patterns of service delivery for patients with chronic wounds. Wound healing is a complex multi factorial process and without a reasonable level of knowledge and understanding practitioners will continue to dress rather than treat the wound. Education needs to be targeted to ensure that practitioners have a good level of understanding of the pathophysiological processes, a good knowledge of objective assessment techniques and most importantly are able to relate the two. As patients survive for longer with more complex and multifactorial disease processes chronic wounds will become more common and if these patients are to be cared for appropriately and cost effectively then more specialist centres are required that are able to carry out advanced diagnostic techniques and utilise more sophisticated wound

management techniques and where multidisciplinary teams of experienced clinicians may determine the underlying problems and if possible address these but also extremely importantly identify where it is not possible to address them and plan appropriate management around realistic goals and objectives.

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